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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS**

Applicant(s): Colvin, Butler, Korniski

Serial No: 10/709,704 Group Art Unit: 2855

Filed: 24 May 2004 Examiner: McCall, Eric

Title: PORTABLE VEHICLE EXHAUST FLOW SENSOR

Attorney Docket No.: 81100109

**APPELLANTS' REPLY BRIEF UNDER 37 C.F.R. §41.41**

Appellants re-submit this Reply Brief originally filed on February 19, 2007 in response to the Examiner's Answer mailed January 9, 2008 for consideration by the Board of Patent Appeals and Interferences.

## REMARKS

### Reply to (5) SUMMARY OF CLAIMED SUBJECT MATTER

The Examiner's Answer states that the Appeal Brief is deficient with respect to Section 5, Summary of Claimed Subject Matter, apparently in that it is not "concise" enough and goes beyond the claimed subject matter to limitations that have no nexus with Appellant's claim language. Appellants respectfully disagree.

Appellants' 3-paragraph summary provides reference numerals and Figure numbers to summarize the invention claimed in independent claims 1, 15, and 32 as required: a system and method for measuring exhaust gas flow in a vehicle. Independent claims 1 and 32 require a screen in the exhaust flow while independent claim 15 requires a flow restricting element that extends substantially entirely across a cross-section of a tube placed over an exhaust pipe of a vehicle.

Contrary to the Examiner's position, Appellants do not rely on unclaimed elements in distinguishing their invention from the prior art or in summarizing the "claimed invention". The missing nexus that the Examiner complains about is the "screen" required by the claims. Appellant is not required to define "screen" in the claims, as the Examiner is apparently demanding, but rather relies on the specification and drawings for proper interpretation of this term, which define screen implicitly by example, by illustration, and by contrasting a screen with the prior art Laminar Flow Element (LFE).

As such, Appellants respectfully disagree and believe that the originally filed brief complies with 37 CFR 41.37(c)(1)(v).

## **Reply to Examiner's Response to Argument**

The main point of contention in this appeal is proper claim interpretation. When properly interpreted, Appellants' claims are neither anticipated, nor rendered obvious by the prior art. Appellants' position with respect to individual claims follows this section.

The Examiner must determine the scope of the claims "not solely on the basis of the claim language, but upon giving claims their broadest reasonable construction in light of the specification as it would be interpreted by one of ordinary skill in the art." (MPEP §2111, citing Phillips v. AWH Corp. 414 F.3d 1302 (Fed. Cir. 2005, underlining added). "The 'PTO applies to verbiage of the proposed claims the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in applicant's specification." (MPEP §2111 citing In re Morris, 127 F.3d 1048 (Fed. Cir. 1997), underlining added). While it is improper to import limitations from the specification into the claims, "reading a claim in light of the specification, to thereby interpret limitations explicitly recited in the claim, is a quite different thing." MPEP §2111. As described in greater detail herein, there is no need to import any limitations from the specification to Appellants' claims to distinguish them from the prior art. The limitation, a screen, is already in the claim language, and if properly interpreted patentably distinguishes Appellants' invention over the prior art.

Appellants claimed invention is a system/method for measuring exhaust gas flow that has various advantages over the prior art laminar flow element (LFE) devices that incorporate a capillary section as disclosed by Weigand (US5,837,903). Various advantages of Appellants invention are directly associated with using a screen rather than an LFE. Independent claims 1 and 32 explicitly recite a screen. Appellants do not argue that any additional limitations should be incorporated from the specification into the claims, which would be improper as noted by the Examiner, but only rely on the specification and drawings to illustrate and describe a screen and explicitly contrast a screen with an LFE. Thus, the Examiner's position that "no nexus exists between any

such arguments and the actual terminology used in the claims" is simply incorrect.

The Examiner is not entitled to ignore Appellants' description of a screen in the specification and drawings (along with the attendant advantages of using a screen instead of an LFE) and instead substitute the Examiner's opinion of what the "exhaust encounters", what the "exhaust sees" or "what the Examiner will call 'a grid'" in deciding that a capillary section as disclosed in the Weigand reference anticipates a screen as claimed by Appellants. Likewise, the Examiner can not rely on extrinsic evidence, such as an improperly referenced dictionary definition (cited for the first time in the Examiner's answer) in which the Examiner selects a convenient portion of one of presumably several definitions to support a rejection for anticipation. Even if the use of extrinsic evidence were appropriate, and in this case it is not, "in construing claim terms, the general meanings gleaned from reference sources, such as dictionaries, must always be compared against the use of the terms in context, and the intrinsic record must always be consulted to identify which of the different possible dictionary meanings is most consistent with the use of the words by the inventor." MPEP §2111.01(iii) citing ACTV, Inc. v. The Walt Disney Company, 346 F.3d 1082, 1092 (Fed. Cir. 2003). Appellants note that Webster's Ninth New Collegiate Dictionary, Merriam-Webster Inc., Publishers, Springfield, Mass. 1986, p. 1055, provides a definition consistent with Appellants use of "screen" in the specification and claims, i.e. "a perforated plate or cylinder or a meshed wire or cloth fabric", clearly distinguishable from an array of ceramic capillary tubes as disclosed by Weigand.

The Examiner next argues that "since 60% is greater than half, element 18 is interpreted as covering substantially the entire area of the exhaust pipe as claimed in claim 12." Again this is simply an unsupported opinion of the Examiner, contrary to the ordinary and customary meaning of "substantially the entire area" as that phrase would be understood by one of ordinary skill in the art in light of Appellants specification and drawings. Even giving "substantially" a broad interpretation, it must be read with the phrase it modifies (the entire area) and in light of the specification (See Figs. 2, 3, Paras. 27-28, 31-32). When properly interpreted, Appellants' claim 12 is clearly distinguishable over the

capillary section of Weigand, which clearly does not substantially cover the entire area of the exhaust pipe.

The Examiner's argument that no nexus exists between the claim language and Appellants' arguments relative to formation of condensation and use of a heating element as disclosed by Weigand has already been addressed, i.e. the nexus is the claim terms, which must be interpreted in light of the specification and drawings. As such, Appellants' arguments contrasting a capillary section of a LFE, which has a significant thermal inertia (capacity) and requires a heater to prevent condensation, to the screen disclosed and claimed by Appellants, which does not require a heating element, and does not condense water vapor, are clearly relevant. These arguments support Appellants' contention that Weigand does not disclose a screen, and that the capillary section is not equivalent to a screen or an obvious variation of a screen. Likewise, Appellants' arguments with respect to the LFE disclosed by Weigand being used on a test stand in contrast to Appellants invention that can be used on a vehicle are relevant for proper claim interpretation in addition to being relevant to a proper determination of obviousness under 35 USC §103.

With respect to Appellants' claimed screen mesh or size of about six strands per inch, the Examiner is again attempting to use a relative term ("about" in this case) as a license to improperly expand the scope of the claim. As previously addressed, because Weigand does not disclose the use of a screen, Weigand does not disclose any number of strands per inch or mesh size and can not be properly interpreted to disclose or suggest using a screen with a mesh of about six strands per inch as claimed by Appellants. The Examiner's rejection is apparently based on the capillary section 18 of Weigand, but the Examiner has not provided citation to where Weigand discloses about six tubes per inch. Based on the disclosure in Weigand of the size of the capillary tubes (0.05 x 0.05) and the open flow area (72%), Weigand suggests about 18 capillary tube walls per inch, not about six as claimed by the Examiner. Note that Appellants preferred open flow area is 60-65% and the representative embodiments have larger open spaces (0.1317 x 0.1317) and thicker "strands" (0.035), as described in Para. 28, to reduce or eliminate condensation, minimize back pressure, and generate a measurable pressure differential that produces the desired flow measurement

accuracy. Again, Appellants reliance on the specification is not to import these additional limitations into the claim, but to properly interpret "about six strands per inch" and to support Appellants position that "about six strands per inch" is not an obvious modification of the 18 capillary tube walls per inch as taught by Weigand.

**Reply to - (9) Grounds of Rejection Under 35 USC §102(b)**

With respect to claim 1, Weigand (US5,837,903) does not disclose a method for real-time determination of exhaust flow through an exhaust pipe of a vehicle, and does not measure a pressure difference upstream and downstream of a screen. Rather, Weigand discloses a method for laboratory measurement of an engine on a test stand using a laminar flow element or LFE (Fig. 6, Col. 7, ll. 48-60). Weigand does not disclose measuring a pressure difference upstream and downstream of a screen as claimed. Rather, Weigand discloses measuring a pressure differential upstream and downstream of a capillary section 18 of ceramic material comprised of an array of capillary tubes preferably about 3 inches from inlet to outlet. (Abstract; Fig. 1; Col. 2, ll.37-43; Col. 3; ll. 34-45).

With respect to claim 12, Wiegand discloses a capillary section 18 and not a screen as noted above. In addition, as shown in Figure 1, and admitted by the Examiner, capillary section 18 covers more than half of the exhaust flow, but clearly not the entire area. Covering more than half the area simply does not anticipate covering substantially the entire area as claimed, even with a broad interpretation of "substantially".

With respect to claim 13, the capillary section 18 of Weigand includes capillary tubes that are sized to minimize blockage from exhaust particles, to create a differential pressure, to minimize back pressure (Col. 3, ll. 44-50), and to produce a laminar flow (Col. 5, ll. 31-52). However, they are not sized to minimize formation of condensation as claimed by Appellants. Rather, Wiegand uses a heating element 118 to maintain a temperature of about 150°F prior to engine start to avoid condensation in the device (Col. 7, ll. 60-67). "This preheating is necessary to prevent the thermal inertia of the ceramic laminar flowmeter from condensing exhaust gas water which will plug and occlude the

capillary tubes of the capillary section and result in inaccurate readings." (Col. 9, ll. 55-59, emphasis added).

With respect to claim 14, Weigand discloses a capillary section 18 made of an array of parallel ceramic capillary tubes extending about three inches from inlet to outlet (Col. 3, ll.35-43), not a screen or strands that form a screen as claimed. The capillary section 18 does not extend across the exhaust pipe (see Fig. 1) as claimed by Appellants. Again, Appellants are not required to define the meaning of "about" in the claim, and extending "more than half-way" (See Fig. 1) does not anticipate extending across the exhaust pipe as claimed.

With respect to independent claim 15, Weigand does not disclose a portable system having a tube adapted for placement on an exhaust pipe that has a flow restricting element extending substantially entirely across a cross-sectional area of the tube as claimed. Again, the presence of "substantially" does not modify the meaning of "entirely" to mean "about half-way across" or "a little more than half-way across" as apparently argued by the Examiner. Weigand discloses a capillary section 18 that is used to create a laminar flow and does not extend across the tube (See Fig. 1).

With respect to claim 20, the flow restricting element of Weigand is a capillary section 18 comprised of an array of ceramic capillary tubes (Col. 3, ll. 34-50), which does not anticipate a screen as claimed by Appellants.

With respect to claim 21, the Examiner is apparently relying on "a typical exhaust pipe" and Fig. 2 of Weigand, which is a "partial view of the square shaped capillary tubes of the capillary section of the laminar flow element device" (Col. 3, ll. 1-3, emphasis added), to anticipate Appellants' claimed screen comprising "a plurality of strands arranged in a generally square array with less than ten strands per inch." The capillary tubes of Weigand are preferably about 0.05 by 0.05 inches with an open area of about 72% (Col. 3, ll. 39-42), which results in about 17 capillary tubes per inch. Seventeen per inch, even "about" 17 per inch clearly does not anticipate less than ten per inch even if the capillary tubes of Weigand were deemed to anticipate a screen with strands as claimed by Appellants.

With respect to claim 24, Weigand discloses a capillary section 18 comprised of an array of capillary tubes shown in cross-section in Figure 2 (Col.

3, ll. 35-38) where the "aggregate open internal area of the array is preferably about 72 percent relative to the interior area of the body." (Col. 3, ll. 39-41). "About 72 percent" does not anticipate 60-65% as claimed.

With respect to claim 32, Weigand discloses a capillary section 18 comprised of an array of capillary tubes preferably about 3 inches from inlet to outlet (Col. 3, ll. 35-50), which does not anticipate a tube with an interior screen as claimed by Appellants.

#### **Reply to - (9) Grounds of Rejection Under 35 USC §103(a)**

With respect to claims 4, 7, 8, and 35, the Examiner's position that these claim "merely set forth a mathematical manipulation to determine the exhaust flow which would be within the realm of one having ordinary skill in the art" is insufficient to support the rejection. The "mere mathematical manipulations" claimed were developed by Appellants to provide a real-time, accurate estimate of exhaust flow in a flow sensor that uses a screen as opposed to a capillary section in an LFE of the prior art. Appellants' specification (Para. 37-40; 41-51) describes advantages and disadvantages of using each of the claimed methods for determining exhaust flow. There is no teaching or suggestion in Weigand to modify the calculations used for a LFE device to those disclosed and claimed by Appellants for use with a screen.

With respect to claim 22, Weigand is certainly not "silent as to the make-up of the entire screen (18)" as stated by the Examiner. Rather, Weigand discloses that "[t]he capillary section 18 consists of an array of ceramic capillary tubes." (Col. 3, ll. 35-36) Weigand also explains why a ceramic material is used in an LFE device: "The capillary section is preferably comprised of ceramic material. Ceramic material provides desirable resistance to the corrosive properties of the exhaust gas and resistance to high temperatures. The high temperatures of the exhaust gas do not affect the dimensions of the ceramic capillaries because of the inherent properties of the refractory material." (Col. 4, ll. 12-17). While Weigand suggests the use of stainless steel or nickel alloys for body 10, there is no suggestion, teaching, or motivation to use stainless steel for the capillary section 18. Rather, Weigand teaches away from using stainless steel for capillary section 10 based on the Weigand's awareness of stainless steel

for use in body 10 and describing the reasons for selecting a ceramic material for capillary section 18 without any suggestion of stainless steel or any other alternative materials.

With respect to claim 29, the Examiner's stated motivation of a "a desire to eliminate the presence of condensation in the exhaust system" is insufficient to support the rejection of Appellants claimed use of a condensation trap because the condensation problem recognized by Weigand is different in kind (generated by the thermal inertia of the three-inch long ceramic capillary tubes) and therefore solved differently (using a heating element to heat the capillary section). Weigand recognizes that "the thermal inertia of the ceramic laminar flowmeter" may condense water in the exhaust that may "plug and occlude the capillary tubes of the capillary section and result in inaccurate readings." (Col. 9, ll. 50-59). Weigand discloses the use of a heating element 28, 118 extending in coiled fashion about the exterior of the body 12 to heat capillary section 18 to a sufficiently high temperature to avoid this condition and that "[a]lthough the electrical-resistive heating element is preferred because of its low costs and operating capabilities other suitable heating elements could alternatively be used." (Col. 4, ll. 19-38). There is no disclosure or suggestion to use anything other than a heating element, or in addition to a heating element, to solve the problem of condensation caused by the thermal inertia of the capillary section.

With respect to claim 30, the Examiner has failed to identify any teaching, suggestion, or motivation in Weigand or elsewhere for one of ordinary skill in the art to use "a conical screen having an apex pointing upstream; and a baffle disposed downstream of the conical screen" as a condensation trap as claimed by Appellants in place of the heating element disclosed by Weigand. The fact that "a desire exists to eliminate the presence of condensation in the exhaust system" does not render obvious every possible method of reducing or eliminating condensation as the Examiner would imply. It certainly does not suggest Appellants' claimed condensation trap.

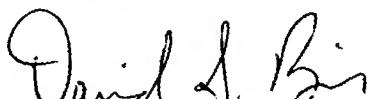
With respect to claim 31, contrary to the Examiner's position (without citation) that "Weigand teaches three ports to extract samples of exhaust gas", Weigand teaches sensing ports 22, 24 (or 122, 124, Fig. 6) to detect the pressure adjacent to the inlet and outlet of capillary section 18 (Col. 3, l. 65-Col. 4, l. 26)

and a port 23 (or 124) for a thermocouple or other temperature sensing device. (Col. 4, ll. 26-29, See also Col. 8, ll. 1-13 ). As understood by those of ordinary skill in the art, pressure sensing ports and thermocouple ports are closed or dead-headed ports that do not extract exhaust gas passing through the tube. Weigand provides no teaching or suggestion to provide a fourth port for extracting samples of exhaust gas as claimed by Appellants. The Examiner's reasoning that the fourth port "is not deemed as being patentably distinguishable over the prior art since the purpose of the fourth port has not been claimed" is contrary to the claim language that the fourth port is "for extracting samples of exhaust gas passing through the tube". This is clearly different in purpose and kind from the closed ports used for sensing temperature or pressure as disclosed by Weigand.

### Summary

Proper interpretation of Appellants' claims in light of the specification clearly patentably distinguishes the claimed invention from the disclosure of Weigand '903. Appellants respectfully request the rejection of claims 1, 12-21, 23-27, and 32 under 35 USC §102(b), and the rejection of claims 4, 8, 22, 29, 30, and 35 under 35 USC §103(a) be reversed and this application allowed.

Respectfully submitted,



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